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**Texas A&M Press**

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*National Security Research Center, Art Director*

**February 2022**

## Contents

# The pitch

With the United States thrust into World War II and the death toll climbing daily into the thousands, a secret laboratory was built in the remote, isolated mountains of northern New Mexico. The preeminent scientific minds of the day would convene there in 1943. By 1945, they had changed the world forever.

Described as geniuses and defined by their brilliance, 18 of these scientists were awarded Nobel Prizes at varying points in their lives.

Just as each laureate has his or her own world-changing, Nobel-worthy achievement, each also has a remarkable personal story. Both are captured in Nobel Laureates of Los Alamos: The Manhattan Project Era.

This coffee-table-style book encapsulates for the first time ever each Los Alamos Manhattan Project laureate's story, with nonfiction narratives and groundbreaking science explained. Written in nontechnical language for a general audience, these stories are framed by never-before-published historic photos as well as original illustrations of each prize winner. Page by page, readers will come to know the remarkable person behind the genius, understand how their scientific achievements bettered our world, and learn about the enduring mission of national security.

# Key points

## What is the overall purpose of the book?

The purpose of this book is to profile, chapter by chapter, each of the 18 Nobel laureates who contributed to the laboratory's wartime efforts. Through narrative, nonfiction profiles with fascinating historical photos and documents, readers will learn who these scientists were, what they accomplished, and why it mattered.

The goal of this book is to educate readers by creating a published chronicle of this important history based on documents and photographs that are a part of the Los Alamos National Laboratory's National Security Research Center. These 18 scientists have two things in common: their wartime work at Los Alamos and their Nobel Prizes. For the first time ever, both are presented as one story.

## Who is the intended audience?

This book's intended audience includes

- those with an interest in science, innovation, military history, World War II, and the Atomic Age;
- a general audience, likely with a local or regional connection to Los Alamos;
- scientists, historians, scholars, and academics;
- current and former Los Alamos National Laboratory employees;
- other federal government staff, in particular the National Nuclear Security Agency, Department of Energy, and other national laboratories that were connected with or grew out of the U.S. government's Manhattan Project.

## How long is this book?

Nobel Laureates of Los Alamos is approximately 200-page, 10-inch by 10-inch square hardback book. Each chapter includes one laureate's nonfiction narrative profile, which averages 1,500 words, as well as photos and other visual elements (such as old, de-classified documents and original illustrations of the laureate). Chapters average six to nine pages framed in bright, bold colors and other eye-catching aesthetics. The book also includes six sidebars that provide contextual information for the reader, such as briefly explaining who Alfred Nobel was and why he established the Nobel Prize; how Nobel recipients are selected; and why "the father of the atomic bomb," J. Robert Oppenheimer, never won a Nobel Prize.

## When will the book be ready for review?

Spring 2022.

# Book outline

- Table of Contents
- Introduction
- Foreword
- Acknowledgments
- 18 chapters
- 6 sidebars
- Works cited
- Index
- Contributors’ profiles

# Authors/contributors

- 17 authors (NSRC staff, including historians, archivists and communications specialists, plus a historian from the United Kingdom’s Atomic Weapons Establishment)
- 3 editors
- 2 graphic designers
- 1 illustrator
- 5 historical consultants
- 1 physics consultant
- 3 derivative classifiers

# Sample chapter

## Val Fitch: Nobel Prize in Physics, 1980

## By Jacqueline Kilby

It is highly improbable, Val Fitch said, to begin life on a cattle ranch in Nebraska and then nearly 60 years later be in Sweden to accept the Nobel Prize in Physics. Fitch did just that. However, his course of events became probable, he said, thanks to the people in his life. Those people included family and friends he met at the Los Alamos Laboratory, including his first wife, Elise Cunningham, and the best man at his wedding, Hans Courant. Fitch also met important colleagues during the Manhattan Project era, such as Robert Bacher, the leader of the Physics Division at the Lab, who influenced Fitch's career decision to further study electrical engineering and then move on to experimental physics.

Fitch was sent to work at the then-secret Lab as a member of the Army's Special Engineer District (SED). He later described this work with the Manhattan Project, which was the U.S.-led effort to create the world's first nuclear weapons, as "highly stimulating" and "probably the most significant occurrence in my education." After World War II ended and when the Manhattan Project concluded shortly thereafter, Fitch was inspired to return to school in pursuit of electrical engineering and translate that knowledge into furthering high energy physics.

Later, his studies alongside fellow physicist James Cronin ushered in what many consider the golden age of particle physics by using a cosmotron particle accelerator machine to measure the lifetimes of K-mesons.

Fitch's obsession with K-mesons, which are subatomic particles with a mass between an electron and a proton that bind nucleons together in the atomic nucleus, lasted his lifetime and earned Fitch and Cronin the 1980 Nobel Prize in Physics. They discovered that two quantities differed by a few percent, indicating a small and direct symmetry violation showing that the left-right asymmetry is not always completely compensated by transforming from matter to antimatter. These experiments led directly to major progress in elementary particle physics and theories on how the matter of the universe survived the Big Bang.

**Early Years**

Fitch was born on a cattle ranch in Merriman, Nebraska, near the site of the Battle of Wounded Knee, in which nearly 300 of Lakota or Sioux were killed by the U.S. Army in 1890. His parents purchased the property just two decades after the massacre, and the tribe was a large part of his early life. Fitch built a laboratory in the basement of his family home that consisted of a chemistry set, a radio, and other items that helped him learn about the world. After graduating as valedictorian from Gordon High School and attending two and a half years at Chadron State College in Nebraska, Fitch was drafted into the army in 1943; World War II had already been underway for several years.

### Los Alamos Work

Fitch completed basic military training in Kearns, Utah, and was sent to the Army Specialized Training Program (ASTP) in Pittsburgh at Carnegie Institute of Technology, which later became Carnegie Mellon University. The program was designated for those with technical skills.

Fitch concentrated on chemistry, physics, and mathematics in his undergraduate work at Chadron State College, so he chose electrical engineering as his focus in ASTP. The pressure for more manpower in the battlefield mounted, and by 1944 the ASTP units were disbanded. Most of Fitch's friends from the program went off to the European theater in the 95th Infantry. The few left behind from the former ASTP were sent to Los Alamos by the end of 1944. Fitch joined the SED, and was assigned to the British Mission under nuclear physicist Ernest Titterton.

Ernie's team, as it was known, was responsible for developing the timing apparatus for the nuclear weapons implosion program, as well as the electronics for the measurement of the spherical shock wave that passes particular landmarks and physical points after the blast.

In the spring of 1945, Fitch was sent to Wendover Field near the Nevada-Utah border to work on the dummy bomb tests dropped on targets in the Salton Sea lake in California. Titterton's team was installing an apparatus to trigger the detonation and one to record the data from the testing, specifically measuring the simultaneous firing of detonators. Shortly thereafter, Fitch was sent to Alamogordo, New Mexico, to work on the Trinity test. The Lab's staff detonated the world's first nuclear weapon at the site on July 16, 1945, marking the beginning of the Atomic Age and helping to end WWII weeks later. After witnessing the historic event that day in the desert, Fitch remarked that the filler used to insulate the recording-apparatus bunker was completely transparent, with some of the sand turning to glass from the heat of the explosion. The recording apparatus bunker was protected by transparent lead glass and the heat from the explosion first melted the sand and formed the glassy mineral trinitite, which was what Fitch was seeing.

During his time at the Lab, Fitch met Elise Cunningham. She was working as a secretary and dating his friend, Hans Courant, who was a fellow SED and a German-born American physicist. Courant left Los Alamos soon after the end of WWII to finish his college work at Massachusetts Institute of Technology (MIT). Fitch claims Courant "assigned me the job of taking care of his girlfriend… This I did, and we eventually were married… that was a nice story." After a few years of dating, Val and Elise married in 1949. Courant attended the wedding as Fitch's best man. The couple had two sons and were married until Elise died in 1972. He later married Daisy Harper in 1976.

### Post-World War II

The army discharged Fitch in 1946 and he worked as a civilian at the Laboratory for another year. Working on the Manhattan Project inspired Fitch, and he went on to finish his undergraduate degree in electrical engineering from McGill University in Montreal, Canada. He then accepted a position at

Columbia University in New York City with Manhattan Project physicist and future Nobel Laureate James Rainwater. By 1954 Fitch had obtained his Ph.D. in physics from Columbia University, and was then recruited by Princeton University, where he focused on experimental and high-energy physics. A 1963 experiment that Fitch and his co-researcher James Cronin conducted revealed that matter and antimatter obeyed slightly different laws of physics. Fitch and Cronin discovered that energy symmetry was not conserved in weak interactions with two K-meson-like charged particles of the same mass. It was this work that earned Fitch and Cronin the Nobel Prize in 1980.

Around this same time, from 1976 to 1981, Fitch served as chairman of the physics department at Princeton University, where he earned multiple prestigious accolades. He retired from Princeton in 1993, but continued writing articles on particle physics and contributing to the physics community.

Fitch died on February 5, 2015, at the age of 91 after a long and illustrious career. He was survived by those he credited with his not-so-probable ascension from a cattle ranch in Nebraska to a Nobel Prize winning physicist.

## Box:

**Name:**
Val Fitch

**Lived:**
1923-2015

**Los Alamos Contributions:**
Member of the Special Engineer Detachment (SED) during the Manhattan Project. Fitch worked on the apparatuses to trigger the detonation of and record the data from testing.

**Nobel Prize:**
Physics, 1980, awarded "for the discovery of violations of fundamental symmetry principles in the decay of neutral K-mesons." For a long time, physicists assumed that the universe was symmetrical. The left-right symmetry had already been proven violated when, in 1964, Val Fitch and James Cronin discovered that the matter-antimatter symmetry is violated when the neutral K-meson decays. Their experiment also proved that symmetry does not apply during time reversal: reactions going backward in time are not identical to those going forward, changing the thoughts on particle physics and the origin of the universe.

# Sample layout



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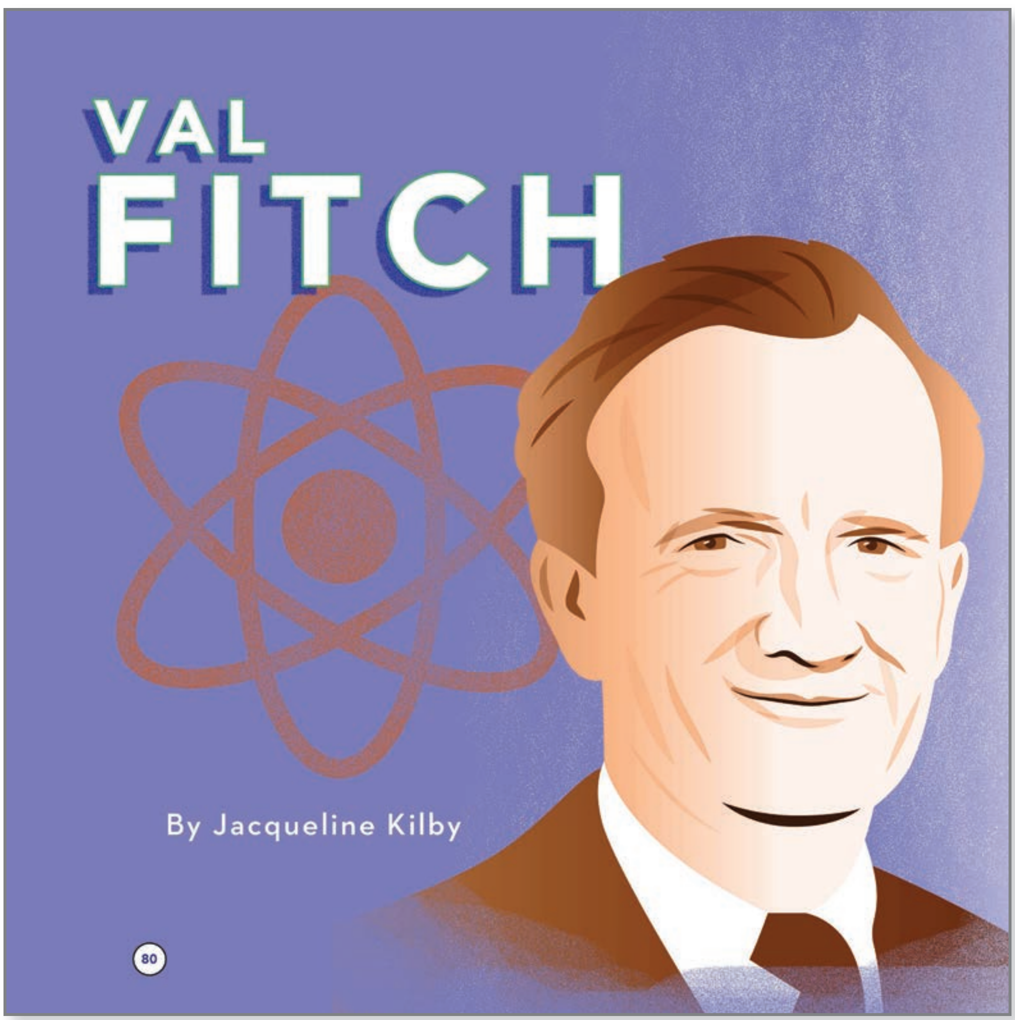
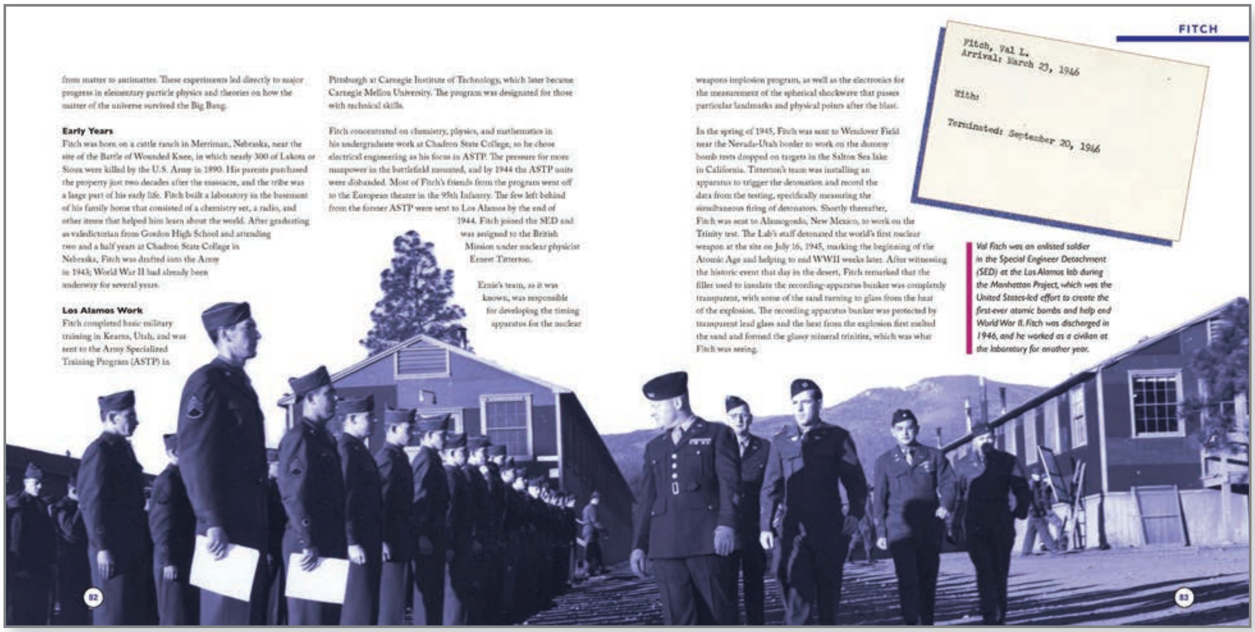
*Trinitite, shown enlarged here, is a glassy residue that remained on the New Mexico desert floor after Trinity, which was the first-ever detonation of an atomic bomb. Trinite is radioactive, but safe to touch.*

81





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With:

Terminated: September 20, 1946

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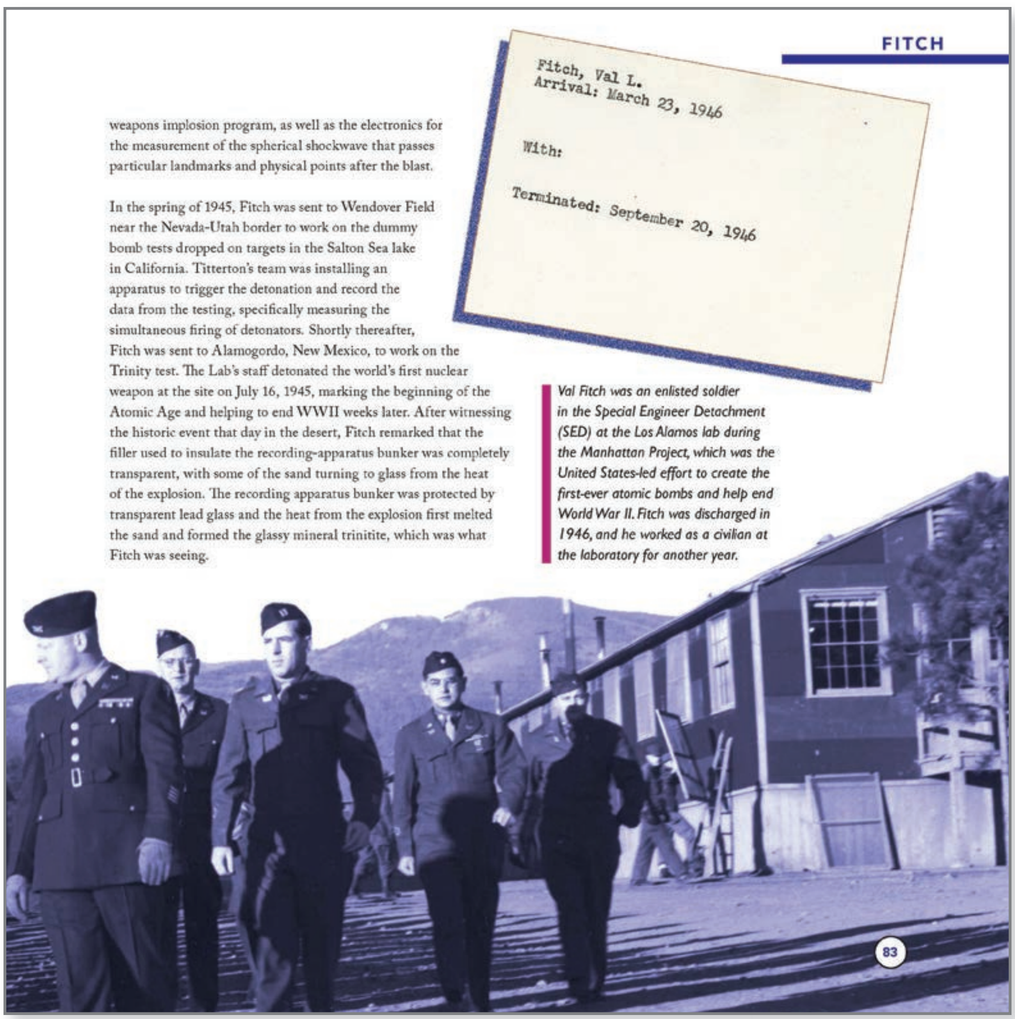
82

83



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83

Val Fitch and his colleagues witnessed the Trinity test on July 16, 1945, from Sandia Peak, approximately 150 miles away from the test site in the northern New Mexico desert.

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Leo Rainwater and Val Fitch inspecting a piece of equipment in the Columbia University Laboratory.

VAL FITCH

1923 - 2015

LOS ALAMOS CONTRIBUTIONS

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NOBEL PRIZE: PHYSICS, 1980

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85